Land-Tech
LANDFILL TECHNOLOGIES OF ARECIBO, CORP.

Friday, July 09, 2010

VIA EMAIL (Donald.Frankel@usdoj.gov)
Donald G. Frankel
Trial Attorney
U.S. Department of Justice
Environmental and Natural Resources Division
Boston Field Office
One Gateway Center
Suite 6165
Newton Corner, MA 02458

Re: **SETTLEMENT COMMUNICATION SUBJECT TO FED.R. EVID 408**
RESPONSE TO EPA's 5/27/10 COMMENTS ON AUGUST 2008
PRELIMINARY DESIGN SUBMISSION

Dear Mr. Frankel:

We thank you for your comments and concerns expressed in your communication of May 27, 2010 and conference calls of June 17 and 25, 2010, in reference to the preliminary August 2008 design for a gas collection and control system (GCCS) for the Arecibo landfill.

We address each of your comments below. To put our answers in the proper context we confirm our sincere interest and intent to design a GCCS that is effective, efficient and in full compliance with EPA requirements.

Our design team took into account general local conditions affecting landfill operations in Puerto Rico and the actual operation of the Carolina GCCS. We selected this system as our reference because of EPA's recognition that this system is well operated and maintained. This means there is good control of air leakages into the system avoiding the dilution of the biogas that is collected and fed to the control system (flare). The ROI used at this landfill was 43 meters.

The concern is that the Langem equations grossly overestimated the gas in the Carolina Landfill resulting in an over designed GCCS. This over design adversely affected stack test results required under the applicable regulations and reduced the flare efficiency to the extent that it impaired the

demonstration of compliance with the 98% control efficiency criteria required by EPA. This overdesign resulted in low concentrations of methane, low flow and low temperatures, due no to ineffective operation and maintenance but to the limited amount of biogas available. The Langem model is based on average empirical values and many presumptions including that the landfill has been operated and maintained within reasonable good operational and housekeeping practices; proper application, compaction and daily cover of the wastes and avoidance of fires, among other many tasks required. These presumptions do not necessarily apply to the operation and maintenance of the Arecibo Landfill particularly before 1999 when LTA assumed the operation of the facility. This site was not operated as a landfill until 1980, but as an open dump burning site. In addition, the record keeping was erratic and is very unreadable especially from 1973 to 1980. At least since 1999 when LTA assumed the operation of the landfill there have been no fires at the landfill, but there were several instances of fire incidents before that date, which could have consumed most of the biogas accumulated over the years. We consider reasonable to conclude that the biogas produced in the Arecibo landfill has been constantly leaking over the years and consumed by a history of frequent fires at the site.

The Langem equations predict a very conservative amount (overestimation) of biogas even in a historically well operated landfill. The Langem manual states this itself and recommends to use their equations only in the absence of actual measured data as the bases of the design.

In summary;

1. The Langem equations generally over estimate the amount of biogas even in historically well operated Landfills. The Carolina landfill, with a much better operational history than Arecibo was grossly overestimated which caused the reported failure of the 98% control efficiency criteria in the stack tests.

2. The Arecibo site was operated as an open dump burning site before 1980. The frequent fires have consumed much of the actual biogas produced in Arecibo after 1980.

3. The ineffective O&M prior to 1999 allowed another portion of the gas produced to escape.

4. The inconsistent and unreliable data and record keeping before 1990 do not give us a good data base for our calculations.

5. The Langem manual clearly states that these equations are for estimating purposes and are not the only unique method to determine the design parameters.

For these reasons we decided to propose another approach that would be acceptable to EPA, using alternative EPA equations from March 1991 validated by actual the Carolina LF O&M data (A well operated landfill) and nationally and international accepted standards such as Bagchi; "Design of Landfills and Integrated waste Management", 2004 which establishes ROI of 45 to 60 meters. Vignerault recommends values of above 60 meters using TOUGH2-LGM program. Several other authors all coincide on ROI from 40 to 65 or more meters.

We proposed the use of the formula presented in the EPA 1991 document (Proposal and Guidelines EPA-450/3-90-011a, March, 1991) because it better predicted the conditions that we are actually observing in Carolina, San Juan and other landfills in P.R. Arecibo would have even less biogas potential because of their O&M history. Our approach proposed was to install wells to obtain actual O&M data to use in completing the final design and leaving these installed wells as part of the final GCCS system. This way the cost allocated to testing would be reduced. This was referred as phase 1. In reality our intent was to have a testing phase to compare against Langem predictions.

As discussed and agreed in our conference calls with EPA on June 17 and 25, we will set aside the 2008 preliminary design and submit a revised conceptual design for EPA comments and approval. We propose to submit this new conceptual design no later than August 24, 2010.

With this background on the engineering intent to produce an effective, efficient design that would better reflect biogas capacity in full compliance with EPA and EQB, we proceed to address each of your comments.

a. The revised plan shall state that the system is an active one that will comply with Rule 709 since it has no liner.

b. We chose to use EPA's formula from the March 1991 EPA Proposal Standards and Guidelines because it better reflected the special conditions of the Arecibo landfill. We also compared this with international standards and found the ROI value of 46m to be within acceptable limits established.

    i. The reason we used 125 cm/mg instead of 100cm/mg as the methane potential in the calculation of the peak flow rate was to allow for a more conservative peak flow (an additional "safety factor").

    ii. The t value of 30 years is based on 1980-2010 for the areas that have been closed. Any biogas generated from 1973-1980 is presumed lost or burned and no longer in the landfill.

    iii. The record keeping was very inaccurate or none at all from 1973-1980. The O&M practices were open dumps burning. The changes in landfill practices started in 1980 after the 1976 RCRA requirements became effective. In other words this facility was not operated as a sanitary landfill from 1973 to 1980. We are willing to discuss and agree with EPA a way that we can reasonably develop some acceptable data for this period.

    iv. The 4 million mega gram design capacity calculation was based on the actual and projected landfill volume and topographic measurements, historical and projected waste deposition. It was the total for the

landfill. For our new design these figures are being revised and will be submitted with the revised GCCS Plan.

v. The R value was the average rate from 1980 to closure based on actual data. For our new design these figures are being revised and will be submitted with the new design. The rates from 1973 have no relevance since this was burned and not land filled.

vi. The figure of 21,024 cm/yr-m for gas flow per well was calculated using the EPA March 1991 Background Document.

vii. The figure of 1000 lb/ cy is an average density based on data from several characterization studies, historic data and operational experience, including the amounts of different materials and the characteristics of the compaction equipment. This value can vary any given day depending on the waste variations each day. However, this value represents the long term average based on the data available.

c. In order to calculate peak gas flow rate for reaction 4.1 of the 2008 preliminary design plan we used t=30 and r=139, 700mg/yr. However, we will readdress this in our revised conceptual design.

The reference to the 400 scfm for 2007 was to reflect recent data as a validation value to compare. The 20 scfm was used as a support value reflecting 40 wells. This compared favorably with 35 wells in the preliminary design with the awareness that the final design may have to be adjusted to 40 or more wells based on test results.

d. The Arecibo Municipal Landfill began operations in 1973 and LTA became its operator in the summer of 1999. LTA has no knowledge of changes in the design capacity of the landfill which may have occurred after May 30, 1991, and, as such, consider, with the information currently available , that the NSPS provisions under 40 CFR 60 Subpart WWW, do not apply to the Arecibo Municipal Landfill. The emission guidelines of the Part VII rules apply to the Arecibo Municipal Landfill in consideration that it has accepted waste after November 8, 1987, has a design capacity in excess of 2.5 million mega grams and 2.5 million cubic meters, and has reported a non-methane organic compound emission rate in excess of 50 mega grams per year.

e. The revised design plan will include the revised closure date and details of the operation of the GCCS in compliance with Rule 702(f)(4)

f. The revised design will not include two phases. It may include a test phase or it may not. We will submit a letter of design intent on July 9. 2010, stating if we will propose a test phase or not.

g. We will provide a construction schedule when we issue the new preliminary design plan (not with the conceptual design).

h. We no longer will have two phases. The word temporary is misused. The correct word is interim; indicating phase 2 would be implemented at a later date.

i. We will submit topographical maps, FEMA flood maps, zoning maps, etc, as part of the complete design package. Drawings T-110, 120 and 140 of the preliminary design submitted in 2008 show a topographic of the landfill site. However, a separate drawing will be issued titled "Topographic Plan".

j. LFT is revising the volumetric and topographical measurements of the landfill and its projected growth to include in the new design.

k. The values of these parameters are presented in Appendix A pages 11,12,13,14 and 15.

l. The values of these parameters are presented in Appendix A pages 11-15.

m. There are three positive displacement blowers 15Hp, variable drive 350-3510rpm, with a Capacity of 800 cfrm each at 3510 rpm. These are shown in drawings M-100, M-120, and M140.

n. The flare efficiency is guaranteed by the manufacturer under a contractually required process guarantee. This is based on expected quality and quantity of gas and therefore we must make sure our projections of these values are based on effective and efficient good engineering practices.

o. The calculations were done using the Mueller equation to determine pressure drop in the piping and collection system. Standard reference values for the blower and piping system were obtained from the manufacturer's recommendations for vacuum operation. This resulted in a negative pressure of 40 inches w.c. at the blower intake. The pressure drop to the different points within the piping system was then limited to less than 5 inch wc resulting in the required piping size. See pages 10 and 15 in Appendix A of the Preliminary Design Basis and Specifications submitted to EPA.

p. The piping materials, size, diameter and height are stated in drawings M-100, M-120, M-140, M-210, M-220, M-240 and specifications on page 6-7. These call for HDPE or PVC for SDR 17 schedule 40 except the flare station (including demisters, blowers, etc.) which calls for 304SS schedule 10.

q. We will use the Darcy-Weisbach equation instead of the Muller equation in our design.

r. Details and descriptions or holes and trenches are provided in drawing M-200 showing that these allow for centering of pipes and proper placement of gravel (aggregate) back fill.

s. Details for the gravel (aggregate) are provided in drawing M-220.

t. Details for the connections for the collections devices are provided in drawings M-200, M-210 and 220. The sampling ports will be details in final design.

u. We will also include gauge pressure on our monthly monitoring as per Rule 706 (a)(1).

v. A diagram showing the location of the wells and header piping are shown on drawings T-140 and T-160. The inactive area is shown in T-140 (where the wells are installed). The active area is shown in T-160 (where wells are located). A new drawing will be issued clarifying location as much as possible based on data available. The gas mass and flare location are given on the upper left corner of drawings T-100, T-120, T-140 and T-160.

w. The condensate water flow system (wellhead) temperature chart on page 14 provides an estimate of condensate flow in gallons per /hour per/100 cfm as a function of well head temperature. For temperature of 100*F the chart gives a value of 2 gal/hr per/ 100 cfm. for 750 cfm you get 15gph.

x. To reduce and control air intrusion or gas migration we have designed the system to operate at a negative pressure of 40 inches of water at the blower inlet, which is well within the air tightness specifications of the piping and equipment specified as guaranteed by the manufacturer. Pressures along the piping were calculated using the Muller equation. We will redo these calculations as requested by EPA using the Darcy-Weishbach equation.

y. We will provide detailed calculations, specifications and procedures of the design when it is "issued for constructability and operability review. This level of detail is not normally included in a conceptual design or preliminary design such as the 2008 design plan submitted to EQB.

z. We will provide a topographical map showing the surface monitoring rate as required in PR Rule70J with our new design.

Sincerely

Eng. José C. Zayas
Operations Vice-president

Arecibo GCCS Gas Estimation and ROI determination BASIS OF DESIGN

The Arecibo facility was operated as an open dump burning site from 1970 until 1999, as witnessed by several well-informed sources, with first hand knowledge on the operation of the facility during years prior to LFT's arrival in 1999. As a matter of fact LFT was originally hired to extinguish a fire at the landfill that lasted over two weeks. Based on this fact of frequent landfill fires in Arecibo it becomes evident that the waste accumulation for purposes of gas generation should start in 1999. The gas remaining from the waste of that time is inexistent since the fires consumed not only the waste but also any biogas that had potentially accumulated. The Engineering and Design manual of the US Army Corps of Engineers for Landfill Off-Gas Collection and Treatment Systems recognizes this fact. It also states that for even well operated "Landfills that are several decades old are less likely to produce expected quantities of landfill gas as most of the biological decomposition of the waste will have already taken place." We consider reasonable to conclude that any biogas produced in the Arecibo landfill has been consumed by a consistent and frequent history of fires at the site up to 1999.

This is the reason to recalculate the estimated landfill gas emissions using as initial date of 1999 (landfill opened year). This recalculation was performed using LandGEM Version 3.02.

Under this scenario our concern that the LandGEM equations grossly overestimated the gas is not a significant issue any longer and the resulting design will be according to the applicable regulations and demonstration of compliance with the 98% plus control efficiency criteria required by EPA.

The Langem model is based on average empirical values and many presumptions including that the landfill has been operated and maintained within reasonable good operational and housekeeping practices; proper application, compaction and daily cover of the wastes and avoidance of fires, among other required. These presumptions apply to the operation and maintenance of the Arecibo Landfill only after 1999 to the present.

ROI Estimation

EPA's 30 m ROI recommended value is based on average of empirical data collected from US landfills.

However, we consider that such value should not apply in then case of the Arecibo landfill due to the documented history of frequent landfill fires that were experienced before Landfill Technologies of Arecibo took control of its operation and which consumed the accumulated landfill gases. A well documented federal engineering and design guidebook cited below prepared by the US Corps of Engineers ("U SCOE") arrives at equally acceptable conclusion regarding ROI for many landfills. Pursuant to the USCOE manual these values go up to 60 m with an average value of 43 – 48 m. In the case of Arecibo landfill this average value of 43 – 48 m is equally justifiable. T he Engineering and Design manual of the USCOE for Landfill Off-Gas Collection and Treatment Systems (EM 1110-1-4016: May 30 , 2008) mentions as follows in its section of design procedures for active well collection systems:

> 3.11.1 General. Spacing of LFG collection wells for active systems if highly dependent on site-specific variables such as waste density, waste moisture content, waste thickness, well design, and cap configuration. The following methods have been used to determine the well spacing of LFG collection systems:
>
> > "Rule of thumb criteria. This method relies on past experience to aid in the layout of the gas collection wells. Some designers correlate gas vent well spacing to the depth of the waste. Typically, wells are spaced no farther apart than 3 times the depth of the waste with a maximum acceptable spacing of 300 feet."

The Engineering and Design Manual also refers to work done by Bagchi and others, and concludes that ROI of 43 to 48 m are adequate.

Therefore, we used the USCOE design manual to determine the necessary number of wells required to effectively extract the gas content in the landfill and the resulting ROI of 46m. The gas collected per well is the true design capacity control.

October 29, 2010

RE: Immediate measures to improve the Arecibo Landfill Operation

Landfill Technologies Corp. has taken some immediate measures to improve operations at the Arecibo Municipal Landfill.

The following measures have already been implemented or will be realized in the following weeks, as additional immediate operational improvements of the Arecibo Municipal Landfill.

1. All the landfill side slopes of the landfill were verified for signs of erosion. Additional daily cover material was placed on some side slopes that revealed some evidence of erosion. Also shredded yard material was applied to some landfill side slopes as an additional erosion control measure.

2. The scrap metal staging area was relocated to the top of the Landfill, to assure that no scrap metals will be located near the landfill perimeter which is of easier access to potential scavengers. This measure was taken as a measure to prevent unauthorized illegal entry to the landfill.

3. The silt fence along the perimeter of the landfill was totally reinstalled in order to assure the capture of sediments and flying debris inside the landfill site.

4. Eight downchutes structures were constructed to direct stormwater from the top of the landfill to the landfill slope toe, to prevent excessive erosion due to stormwater events and also to minimize stormwater accumulation and contacts at the active disposal area. Downchutes consisted of 18-inch diameter plastic pipes and concrete headwalls with energy dissipation devices. Three additional stormwater downchutes are planned along the North Slope of the landfill.

5. The area near the maintenance shop was leveled to improve the area stormwater drainage.

6. Truck tire washing area was constructed at the landfill site exit, in order to remove excess dirt from vehicle tires as these exit the landfill.

7. Drainage from the top of the landfill was improved by leveling the top of the landfill and directing stormwater flow to the downchutes. The working face location size and general arrangement of the active disposal area was redesigned in order to achieve proper drainage, preventing unnecessary retention of stormwater.

8. The perimeter road was reconstructed along the entire landfill boundary to improve access and proper drainage of stormwater.

9. In order to prevent unauthorized access to the landfill, additional barbed wire perimeter fencing is planned along the toe side slope at the northeast corner of the landfill.

10. At least 4 warning signs in Spanish and English will be installed in the northeast corner of the landfill alerting that any unauthorized entry is prohibited.

October 29, 2010

RE: Immediate measures to improve the Arecibo Landfill Operation

Landfill Technologies Corp. has taken some immediate measures to improve operations at the Arecibo Municipal Landfill.

The following measures have already been implemented or will be realized in the following weeks, as additional immediate operational improvements of the Arecibo Municipal Landfill.

1. All the landfill side slopes of the landfill were verified for signs of erosion. Additional daily cover material was placed on some side slopes that revealed some evidence of erosion. Also shredded yard material was applied to some landfill side slopes as an additional erosion control measure.

2. The scrap metal staging area was relocated to the top of the Landfill, to assure that no scrap metals will be located near the landfill perimeter which is of easier access to potential scavengers. This measure was taken as a measure to prevent unauthorized illegal entry to the landfill.

3. The silt fence along the perimeter of the landfill was totally reinstalled in order to assure the capture of sediments and flying debris inside the landfill site.

4. Eight downchutes structures were constructed to direct stormwater from the top of the landfill to the landfill slope toe, to prevent excessive erosion due to stormwater events and also to minimize stormwater accumulation and contacts at the active disposal area. Downchutes consisted of 18-inch diameter plastic pipes and concrete headwalls with energy dissipation devices. Three additional stormwater downchutes are planned along the North Slope of the landfill.

5. The area near the maintenance shop was leveled to improve the area stormwater drainage.

6. Truck tire washing area was constructed at the landfill site exit, in order to remove excess dirt from vehicle tires as these exit the landfill.

7. Drainage from the top of the landfill was improved by leveling the top of the landfill and directing stormwater flow to the downchutes. The working face location size and general arrangement of the active disposal area was redesigned in order to achieve proper drainage, preventing unnecessary retention of stormwater.

8. The perimeter road was reconstructed along the entire landfill boundary to improve access and proper drainage of stormwater.

9. In order to prevent unauthorized access to the landfill, additional barbed wire perimeter fencing is planned along the toe side slope at the northeast corner of the landfill.

10. At least 4 warning signs in Spanish and English will be installed in the northeast corner of the landfill alerting that any unauthorized entry is prohibited.